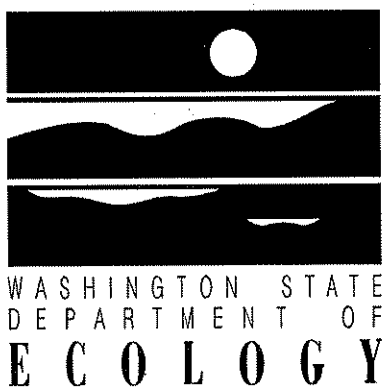

City of Walla Walla
Wastewater Treatment Plant
Class II Inspection

August 1997

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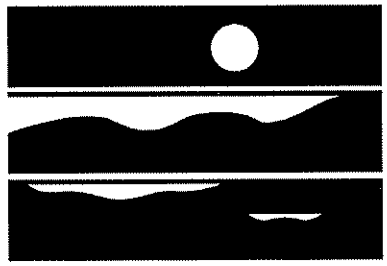

City of Walla Walla Wastewater Treatment Plant Class II Inspection

by
Guy Hoyle-Dodson

Environmental Investigations and Laboratory Services Program
Olympia, Washington 98504-7710

August 1997

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Abstract

An announced Class II inspection was conducted September 16-19, 1996 at the city of Walla Walla Wastewater Treatment Plant, located in Walla Walla County. Prior to the inspection a new procedure of adding alum to the influent was introduced and this produced substantially different treatment conditions than were typical. Influent characteristics were generally similar to typical weak domestic influent. Better than expected reduction in BOD_5 across the primary clarifiers was attributed to the addition of alum. Good to moderate reductions in TSS, BOD_5, and $CBOD_5$ were achieved across the treatment plant. Nitrification was also observed. Based on results determined during the inspection (irrigation season discharge), it was projected that the ammonia nitrogen concentration may exceed water quality criteria at the chronic boundary during the Mill Creek discharge period (winter season discharge). The 24-hour composite BOD_5 concentration exceeded the irrigation season's NPDES permit monthly average limit, but was below the permitted weekly average limit. The percent reduction in BOD_5 concentration across the plant may be less than the monthly average reduction required by the permit. The pH results for all Ecology grab samples were less than the permitted minimum value. Chlorine may exceed the permit narrative limit. All other inspection results were within applicable effluent concentration and load limits stipulated for the irrigation discharge period. Conditional comparisons of results to the Mill Creek discharge permit limits showed an exceedence of the ammonia nitrogen and total residual chlorine limits. $CBOD_5$ exactly equaled the Mill Creek discharge permitted monthly average limits. Walla Walla should ensure that all permitted parameters remain within permit limits during all discharge periods.

Whole effluent priority pollutant organics and metals concentrations were generally within water quality criteria. Conditional comparisons of inspection results to the water quality criteria found that gamma-BHC and lead exceeded the chronic criteria. Dilution at the Mill Creek chronic boundary would not be expected to reduce these concentrations to within the criteria. Walla Walla should ensure that these concentrations do not exceed water quality criteria. Agronomic analysis of effluent concentrations found that pH and adjusted sodium adsorption ratio (R_{na}) indicate some deleterious effects to crops and soils might be expected. Area farmers have adjudicated water rights to the Walla Walla treatment plant effluent, and it is recommended that Walla Walla evaluate the effluent's impact on irrigated cropland. The sludge selenium concentration exceeded the pollutant concentration limit specified in the EPA standards for land application of sewage sludge. Walla Walla should ensure concentrations meet EPA standards. Ecology analysis of TSS and BOD_5 splits found differences between Ecology and Walla Walla samples. Walla Walla should review sampling techniques to ensure representative samples.

Summary

Flow Measurements

Estimated daily 24-hour combined totalized effluent flows recorded during the inspection were 5.18 MGD for September 16, 5.90 MGD for September 17, and 5.87 MGD for September 18. The average flow over the three-day period was 5.65 MGD. The inaccessibility of the influent Parshall flume precluded independent verification of effluent flow measurements.

General Chemistry Results And Treatment Plant Effectiveness

Treatment Plant Influent

Most influent concentrations were in the range of weak concentrations for typical untreated domestic wastewater. The influent BOD_5 concentration was within suggested design limits for typical trickling filter plants. Total organic carbon (TOC) concentration was substantially less than typical. The BOD_5/TOC ratio was about two times greater than typical values. The weak TOC concentration relative to the BOD_5 is indicative of a smaller load of biologically inactive organic carbon compounds than typical treatment plants, and this should result in fewer persistent organic compounds passed to the effluent.

Primary Clarifier Effluent

Of note was the addition of alum to the treatment plant's influent, which was added to increase sedimentation across the primary clarifiers. Ecology results showed a reduction across the clarifier in BOD_5 and TSS, for an estimated removal efficiency of 60% and 61% respectively. Removal efficiencies for TOC, NH_3-N, and total-P were 7%, 19%, and 18% respectively. The NO_2&NO_3-N load increased by a factor of 6.5.

The total BOD_5 removal efficiency was 50% greater than the high end of the range expected from typical primary sedimentation systems. In contrast, TSS removal efficiencies were well within the typical range and the effect of the alum treatment on this parameter appeared to be marginal. Dissolved total solids decreased by 30 mg/L. These last two unexpected results suggests that the alum treatment was removing a portion of the dissolved BOD_5.

Treatment Plant Effluent

Ecology results for $CBOD_5$ and BOD_5 concentrations both showed 86% removal efficiencies across the entire plant. TSS and TOC removal efficiencies across the plant were 95% and 73% respectively. Ammonia nitrogen and total phosphorous decreased 73% and 93% respectively. NO_2&NO_3 nitrogen concentration across the plant increased by a factor of 20. Chlorine residual concentrations in the grab and composite effluent samples were both 4 mg/L. The pH changed dramatically across the treatment plant, forcing the effluent pH well into the acidic range.

Ecology analyses of the Walla Walla samples displayed slightly greater percent reductions in TSS, $CBOD_5$, total BOD_5, and total-P. Slightly smaller reductions were seen in TOC and NH_3-N. and the dramatic change in pH was not observed in the Walla Walla samples. It should be noted that Walla Walla holding temperature for the 24-hour effluent sample was elevated (16° C) and exceeded the 4° C holding temperature recommended for BOD_5 analyses and this likely affected the pH result.

Ecology data suggest reasonably effective treatment of $CBOD_5$, and BOD_5, and highly effective treatment of TSS and total-P. Nitrification was moderately effective. The two grab sample pHs were outside the permissible range stipulated by the water quality standards for class B water. The change in acidity across the treatment plant is unusual and likely related to the addition of alum. The Walla Walla discharge varies between two seasons, one during which the effluent is diverted to irrigation and one when it is discharged directly to Mill Creek. If the effluent was discharged during the Mill Creek discharge period (winter season discharge) the ammonia nitrogen concentration, determined from the Ecology 24-hour composite sample (irrigation season discharge), would exceed the allowable concentration at the chronic boundary by 50%.

NPDES Permit Comparisons

The Ecology composite 24-hour effluent BOD_5 concentration exceeded the irrigation season permitted monthly average limit by 42%, but was within the weekly average limit. The effluent 24-hour composite BOD_5 load was within NPDES permitted monthly average and weekly average effluent load limits. The percent reduction in BOD_5 across the treatment plant was greater than the minimum monthly average reduction required by the permit (85%), but uncertainty about the effluent result may produce a percent reduction less than the minimum. The Walla Walla sample effluent BOD_5 result was within the permitted limit, but due to the elevated holding temperature encountered in the Walla Walla sample the Ecology result is deemed more reliable.

The Ecology 24-hour composite effluent TSS concentration and load were well within the irrigation season permitted monthly and weekly average limits. Percent reduction across the plant was greater than the 85% monthly average reduction required by the permit.

The Walla Walla sample TSS concentration and load gave slightly more favorable results than the Ecology comparisons. The two effluent grab fecal coliform results were well below the permit limits, and the turbidity result was within both the monthly and weekly averages. The pH results for all Ecology grab samples were substantially less than the minimum value required for the irrigation district discharge. The total residual chlorine concentration would likely be in excess of the permitted narrative limit. The reported totalized average influent flow was well below the NPDES permit monthly average wet and dry weather design flows. Influent BOD_5 and TSS loads were well below the permitted peak load limits.

Conditional comparisons of results from samples collected during the inspection to the Mill Creek discharge (winter season) permit limits determined that the effluent total ammonia nitrogen load would exceed the Mill Creek discharge permitted monthly average load by 48%, but would be within the weekly average load limit. The Ecology grab pH results were outside the permitted Mill Creek discharge pH range. The effluent total residual chlorine result exceeded both the monthly average limit and the weekly average limit for the Mill Creek discharge. The Ecology $CBOD_5$ concentration would exactly equal the permitted $CBOD_5$ limit for the Mill Creek discharge. Effluent copper and zinc concentrations were both below the Mill Creek discharge permitted monthly and weekly average limits.

Detected Priority Pollutant Organics And Metals

Predicated on discharge to Mill Creek, effluent results were conditionally compared to water quality criteria. The results from three VOA compounds and one BNA compound did not exceed freshwater acute and chronic water quality criteria. One pesticide compound, gamma-BHC, exceeded the chronic freshwater quality criteria by a factor of 2 and the EPA human health criteria by a factor of 8. Dilution in Mill Creek will not be sufficient to mitigate these exceedences.

Four priority pollutant metals were detected in the plant effluent. The lead concentration determined for the inspection exceeded the freshwater chronic water quality criterion in the whole effluent, and during the Mill Creek discharge period the dilution would not be sufficient to reduce the concentration to within the chronic criteria. Copper, cadmium, and zinc would all be within both acute and chronic water quality limits.

Agronomic Analysis

Comparisons of effluent concentrations to water quality guidelines for irrigation found that the pH was in a range for which some damage to crops would be expected. The effluent adjusted sodium adsorption ratio (R_{na}) lay in a range for which the effluent electrical

conductivity (Ec_w) would create a slight to moderate inhibition on the infiltration rate of wastewater into the soil, resulting in a deleterious affect on crops. Ion toxicity related to boron and sodium concentrations would require no restrictions on irrigation use. Concentrations of trace elements were all well below minimum levels found to affect sensitive crops. Effluent concentration leading to salinity effects were well below the levels that would adversely affect crop water availability. Miscellaneous effects by effluent HCO_3 and Kjeldahl nitrogen were less than minimum concentrations which would affect susceptible crops. Minimum range of acreage (alfalfa) required for uptake of the effluent's nitrogen and phosphorus concentrations would be 133-318 acres and 139-209 acres respectively. Food crops such as barley and wheat would take substantially greater acreage.

Sludge

The sludge fecal coliform density dry weight is well below the maximum limit for fecal coliform density of 1000 #/g dry wt. as required for Class A sewage sludge land application. The selenium concentration exceeded the pollutant concentration limit specified in the EPA standards for land application of sewage sludge. Other metal concentrations did not exceed EPA land application standards. All metal concentrations were within screening limits for the dangerous waste designation criteria.

Split Samples

Sample Comparisons

Walla Walla influent and effluent BOD_5 and $CBOD_5$ results were substantially less than Ecology results. In contrast Walla Walla influent TSS concentrations were substantially higher. The differences in BOD_5, $CBOD_5$, and TSS results were likely due to differences in sampling technique, particularly maintaining the proper holding temperatures. Ecology and Walla Walla fecal coliform results were identical. Walla Walla and Ecology pH results did not compare well.

Laboratory Comparisons

Ecology and Walla Walla laboratory results for influent samples collected by Walla Walla were extremely close. This would suggest that the Walla Walla laboratory performance was good.

Recommendations

Flow Measurements

- Walla Walla should ensure the accuracy and representativeness of the influent flow measurements.

General Chemistry and Plant Design

- Walla Walla should investigate whether the chronic ammonia nitrogen criterion will be exceeded during Mill Creek discharge periods.

NPDES Results

- Walla Walla should ensure that $CBOD_5$ and BOD_5 concentrations remain within permitted limits during all discharge periods.

- Walla Walla should ensure that the future effluent pH remains within the permitted range.

- Walla Walla should evaluate the plant's dechlorination system for deficiencies and ensure that total residual chlorine concentrations conform to narrative permit limits during all discharge periods.

- Since inspection chlorine and ammonia results would have exceeded permit limits during periods of Mill Creek discharge, Walla Walla should ensure that future concentrations will not exceed permit limits during the December-May discharge period.

Detected Priority Pollutant Organics And Metals

- Although the effluent was diverted to the irrigation district during the inspection, Walla Walla should ensure that gamma-BHC and lead concentrations remain within water quality limits during periods of discharge to Mill Creek.

- Walla Walla should evaluate the impact of organic and metal concentrations on surface waters due to runoff from irrigation with plant effluent.

Agronomic Analysis

- Walla Walla should evaluate the impacts of effluent pollutant concentrations on cropland irrigated with their discharge.

Sludge

- Walla Walla should ensure that selenium concentrations in the sludge are within the EPA limits before application to agricultural lands, forest lands, public contract sites, or reclamation sites.

Split Samples

- Walla Walla should review sampling procedures to ensure proper calibration of their pH meter.

- Walla Walla should ensure that their samples are maintained at the proper holding temperature.

Introduction

An announced Class II inspection was conducted September 16-19, 1996 at the city of Walla Walla Wastewater Treatment Plant (Walla Walla), located in Walla Walla County. Guy Hoyle-Dodson, environmental engineer (Toxics Investigations Section), and Dale Clark, environmental specialist (Ambient Monitoring Section), of the Washington State Department of Ecology conducted the investigation. Mimi Wainright, permit manager (Ecology Eastern Regional Office), provided background information and assisted on site during the inspection. Don Caldwell, Wastewater Supervisor, also provided information on facility operation and assistance on site.

The Walla Walla Wastewater Treatment Plant (WWTP) serves the city of Walla Walla (pop: 25,290 - circa: 1986) and the surrounding community (Figure 1). The facility treats sewage from a largely residential population, with a smaller number of commercial and light industrial contributors. Two large industrial food processors (American Fine Foods and D & K Frozen Foods) contribute separate wastewater streams, which are disposed of apart from the domestic wastewater by spray irrigation. An NPDES Permit (WA-002462-7) was issued June 29, 1993 with an expiration date of June 29, 1998.

The Class II inspection was initiated by the Department of Ecology to evaluate permit compliance and to provide information about facility loading and performance. Several days prior to the inspection Walla Walla initiated an experimental procedure of adding alum to the plant influent to enhance primary sedimentation. This created substantially different treatment conditions than normally encountered at the plant, and inspection results may not be completely applicable to typical operation. The operator related that the experimental procedure would continue for most of September and thus should impact comparisons to permitted monthly averages. The inspection also focused on the priority pollutant organics and metals in effluent, agronomically relevant constituents in the effluent, and sludge characterization.

Specific objectives of the inspection included:

1. Evaluate NPDES permit compliance by analysis of influent and effluent permit parameters to determine concentrations and loads and comparing them to respective permit limits

2. Evaluate effluent toxic impact on the receiving water by comparing priority pollutant organics and metals scan results to Washington State acute and chronic water quality criteria

3. Evaluate the agronomic impact of specific constituents in the influent by comparisons to measures of plant toxicity and soil degradation associated with irrigation uses

4. Evaluate treatment plant performance

5. Evaluate the WWTP self-monitoring program through sample splits and independent laboratory analysis

6. Evaluate sludge toxicity by comparisons to federal and state land application and dangerous waste regulations

7. Evaluate receiving water characteristics to ascertain its influence on effluent toxicity

Setting

The Walla Walla WWTP is located in Walla Walla County, Washington, west of the city of Walla Walla on Mill Creek. The WWTP presently consists of a headworks, primary clarifiers, trickling filters, secondary clarifiers, sand filter, chlorine contact chamber, anaerobic sludge digestion system, and a surface discharge (Figure 2). Portions of the existing facility were built as early as 1928, and over the years the facility has gone through extensive upgrades. Since its early conception the city has had a legal obligation to provide its effluent as irrigation water to agricultural interests with water rights to Mill Creek, and this has driven treatment objectives. The destination of the effluent varies seasonally, with treated wastewater released to the Blalock and Gose irrigation districts during the growing season and discharged to Mill Creek during the non-growing season.

A 1981 receiving water study of Mill Creek by Ecology recommended that the period of discharge to the creek be limited to December 1 to May 1 to mitigate the impact of ammonia on the receiving water, and this recommendation was included in the permit in 1983. A 1986 Class II inspection study found that the plant contributed much of the phosphorus and nitrogen loading to the creek. In 1988 the city requested and received $CBOD_5$ limitations for the December to May non-irrigation period in place of BOD_5 limitations. An aggressive infiltration and inflow remediation program over the last 10 years has resulted in a substantial decrease in influent flows. However, increases in overall hydraulic loading from additional hookups to the system may have had a net negative impact.

The WWTP headworks consists of manual barscreen, grit chamber, comminutor, two Parshall flumes, flowmeter, and is followed by a primary clarifier splitter box. Influent flows enter from two channels: the greatest volume entering via the primary channel at the beginning of the headworks, and a much smaller volume entering via the secondary channel just above the Parshall flume. A third contribution from a senior citizen's home enters downstream of the secondary channel, but this flow is small compared to the main channels. Recirculation and sand filter backwash are discharged to the secondary channel, at a location that makes exclusive sampling of the combined primary and secondary flow impractical. An ultrasonic surface level detection device, situated in the converging throat of a Parshall flume, is used to determine flow in the primary influent channel. Flow in the secondary influent channel is measured by a magnetic in-pipe flow meter, located just after the lift station feeding that channel. The combination of these two flow measurement devices determine the plant flow used in evaluating compliance. The contribution from the senior citizen's home was not considered. All industrial contributors discharge directly to an industrial holding pond, separate from the main treatment system. Industrial influent is treated separately by land application.

Wastewater from the splitter box enters two primary clarifiers for initial sedimentation. The clarifiers are connected in parallel and discharge supernatant to the first of three circular trickling filters. Sludge from the primary clarifiers is pumped to two anaerobic digesters that are connected in parallel.

Trickling filter #1 uses a rock medium and discharges a portion of its treated wastewater back to the headworks. The remaining wastewater is discharged to two additional tricking filters, that are connected in parallel. Trickling filters #2 and #3 also use a rock medium and discharge to a system of secondary clarifiers.

The discharge to the secondary clarifier system follows a somewhat convoluted pattern. Effluent from trickling filter #3 discharges to secondary clarifier #1, which is connected in parallel to secondary clarifiers #2 and #3. A portion of trickling filter #3 effluent is also split to secondary clarifiers #2 and #3, which themselves are connected in parallel. Trickling filter #2 discharges only to secondary clarifiers #2 and #3. The supernatant from all three clarifiers discharges to a duo-media sand filter. Sludge is recirculated to the headworks.

Filtered wastewater from the sand filter is pumped to the main chlorine contact chamber. Backwash from the filters is returned to the headworks. The main chlorine contact chamber is connected in series with a standby chlorine contact chamber; which is now used on a regular basis, although originally intended to provide additional contact time during high flows. Chlorination is flow proportional and the effluent is dechlorinated with sulfur dioxide. The final effluent is either diverted to an irrigation channel or surface discharged to Mill Creek, depending on the season.

The sludge digestion system consists of a primary and secondary anaerobic digestor connected in series, a sludge holding tank, and a drying bed. The majority of treated sludge at the Walla Walla facility is hauled by tanker truck to land application sites. The drying bed is used to treat only a small amount of the treated sludge, and the dried sludge is stored on-site.

Procedure

Ecology collected both grab and composite samples at the WWTP. Composite samples were collected September 17-18, 1996 from plant wastewater at three stations (Figure 2 & Appendix A): the primary influent channel at the headworks just upstream of the secondary influent channel and above the Parshall flume, the overflow from the perimeter weir in primary clarifier #2, and the disinfected effluent just above the weir at the end of the chlorine contact chamber. The focus of composite sampling was to obtain the full range of general chemistry parameters. Effluent samples also included metals, organics, and agronomic parameters. All composite strainers were submerged approximately 12 inches below the surface of the flow and positioned to prevent entrainment of sediments. A transfer blank was collect from the effluent composite sampler on September 16, by running deionized (D.I.) water through the compositor tubing into the collection bottle.

All composite samples were collected using Ecology ISCO composite samplers with equal volumes of the sample collected every 30 minutes over a 24-hour period. Due to a misunderstanding about the location of in-plant recycle, the influent compositor was initially set up just above the Parshall flume which contained return from the secondary clarifiers and the sand filter. Similarly, the primary was initially set up in the splitter box into the first trickling filter which contained return from the second and third trickling filter. These compositors where switched to their final locations and restarted, which resulted in collection times being somewhat out of phase with the effluent compositor. Also, due to turbulence in the weir overflow in the primary clarifier, individual aliquot volumes for the 24-hour composite at this location were less than anticipated. Since the full 48 aliquots were taken the sample is believed to be representative of the full 24-hour collection period. All other aspects of composite sampling were without incident.

Grab samples targeting volatile organics, nutrients, total organic carbon (TOC) and total suspended solids (TSS) were collected at the influent (primary influent channel) and effluent composite stations, both in the morning and the afternoon of September 17. Total and weak acid dissociable cyanide samples were collected from the September 17 morning grab. Morning, early afternoon, and late afternoon grab samples for fecal coliform were taken September 17 from the effluent sample location. Digested sludge samples were collected from the sludge holding tank on September 17. A receiving water sample was collected on September 17 at a location approximately one-quarter mile above the treatment plant outfall.

Walla Walla personnel collected influent and effluent composite samples on September 17-18. The Walla Walla effluent sample location was similar to the location of Ecology's effluent composite sampler, but their influent sample location was just above the Parshall flume. Walla Walla composite samples were split for analysis by both Ecology and

Walla Walla laboratories. Parameters analyzed, samples collected, and the sampling schedule appear in Appendix B.

Samples for Ecology analysis were put in appropriate containers and preserved as necessary. Samples were packed in ice for delivery to the Ecology Manchester Laboratory. Holding time restrictions were observed for all samples. Analytical procedures and laboratories performing the analyses are summarized in Appendix C. Sampling quality assurance included priority pollutant cleaning of sampling equipment (Appendix D).

Specific QA/QC Discussions

A transfer blank was submitted for metals analysis to establish baseline sampling conditions. Sampling quality assurance included ultra cleaning (priority pollutant cleaning) of sampling equipment to remove trace priority pollutant contaminates. Sampling in the field followed all protocols for holding times, preservation, and chain-of-custody set forth in the Manchester Environmental Laboratory Lab Users Manual (Ecology, 1994).

Laboratory QA/QC, including holding times, matrix spike and duplicate spike sample analyses, surrogate recoveries, and precision data were, with a few exceptions, within appropriate ranges. Most initial calibration verification standards and continuing calibration standards were within relevant USEPA (CLP) control limits. Procedural blanks were predominantly free from contamination. Qualifiers are included in the data table where appropriate. The following are specific concerns:

General Chemistry

The duplicate of the total coliform (membrane filter method) result for the Eff-5 sample (lab #: 388246) was qualified with "QNS" due to insufficient sample quantity. The original analysis was reported as a non-detect and this result was retained in the report. The BOD_5 result for the Eff-E sample (lab #: 388237) was qualified with the "G" qualifier indicating that the result was greater than the reported value. Inappropriate dilution of the sample produced a day #5 dissolved oxygen concentration of less than 1 ppm. Due to the short holding time, the sample was not reanalyzed.

Volatile and Semivolatile Organics

Low levels of certain target volatile and semi-volatile compounds were detected in laboratory blanks. The EPA five times rule was applied to all target compounds that were found in the blank. If the concentrations of the compounds in the samples were greater than or equal to five times the concentration of the compounds in the associated method blank, they are considered native to the sample.

In the H_2O re-extraction analysis of semi-volatile organics one compound, d5-phenol, resulted in low surrogate recovery. The re-extraction was done to remove any residual acids which appeared to cause degradation of the last internal standard by de-deuteration. Compounds affected by the de-deuteration in the first analysis of Eff-E were the last nine compounds on the target list. All were "J" qualified to indicate the results were estimates. The data are acceptable for use as qualified.

Metals

The procedural blanks associated with lead and potassium in the water sample, as well as zinc and copper in the sludge sample, showed analytically significant results. The lead result for Eff-E is qualified with a "J" due to lead contamination during the analysis. The other water samples showed no lead contamination and are not qualified. The potassium detection level is raised to a level greater than any concentrations detected in the blanks and the result is not qualified. Copper and zinc results in the sludge sample are greater than ten times the results in any of the blanks, and so the data are not qualified. The reported zinc detection level for the sludge sample is raised to 0.8 mg/Kg.

Spike and duplicate spike recoveries for silver in the water samples, as well as antimony, arsenic, and thallium in the sludge sample, were outside the CLP acceptance limits. Silver data for all samples, as well as antimony, arsenic, and thallium data for the sludge sample, are qualified with the "J" qualifier to indicate that the results are estimates. Zinc and lead results from the serial dilution of the sludge sample were respectively 12% and 13% higher in the diluted sample. This shows a probable suppression of signal in the undiluted sample, but the results were not qualified.

Antimony's laboratory control analysis (LCS) was outside the established window and is qualified with the "J" qualifier to indicate that the result is an estimate.

Results And Discussion

Flow Measurements

Walla Walla determines plant effluent flows for NPDES permit reporting purposes by combining independent totalizer flow measurements from measurement devices in the primary and secondary influent channels. A third influent source from a senior citizen home is not presently monitored, but its contribution is considered to be relatively minor. Estimated daily 24-hour (0800-0800) combined totalized effluent flows recorded during the inspection were 5.18 MGD for September 16, 5.90 MGD for September 17, and 5.87 MGD for September 18. The average flow over the three-day period was 5.65 MGD. The inaccessibility of the influent Parshall flume precluded independent verification of effluent flow measurements. Restricted access to the devices may also impair Walla Walla's ability to maintain accurate calibration. Walla Walla should ensure that their verification schedule sustains influent flow meter accuracy, with a minimum frequency as required by the permit.

General Chemistry Results And Treatment Plant Effectiveness

Treatment Plant Influent

Ecology general chemistry results are presented in Table 1. Influent concentrations of 5-day biochemical oxygen demand (BOD_5 - 118 mg/L), total solids (TS - 359 mg/L), total non-volatile solids (TNVS - 172 mg/L), total suspended solids (TSS - 95 mg/L), ammonia nitrogen (NH_3-N - 9.58 mg/L), and total phosphorus (total-P - 3.13 mg/L) were all in the range of weak concentrations for typical untreated domestic wastewater (Metcalf & Eddy, 1991). The BOD_5 concentration is estimated to provide a minimum of 6 lb BOD_5 /day per 1000 ft^3 of trickling filter volume and is within the 5-15 lb BOD_5 /day/1000 ft^3 found for typical designs (WEF, 1992). The 5-day carbonaceous biochemical oxygen demand ($CBOD_5$) was 104 mg/L. The Total Organic Carbon (TOC - 46.6 mg/L) was 58% of the typical weak concentration and the BOD_5/TOC ratio (2.53) was about two times greater than typical values (Metcalf & Eddy, 1991). BOD_5 measures biologically active organic carbon exclusively, but the TOC analysis measures biologically inactive as well as biologically active organic carbon. The weak TOC concentration relative to the BOD_5 concentration indicates a smaller load of biologically inactive organic carbon compounds than found in typical domestic wastewater influents. This would imply a smaller concentration, relative to typical treatment plant influents, of those persistent organic compounds capable of passing through the treatment system.

Primary Clarifier Effluent

Reductions across the #2 primary clarifier were calculated and the results presented in Table 2. Although the #1 primary clarifier effluent was not sampled, it is assumed reductions across both clarifiers were similar. Of note was the addition of alum to the treatment plant influent, which should act to dramatically increase sedimentation across the clarifiers. Ecology results showed a total BOD_5 reduction from 118 mg/L to 17 mg/L across the clarifier for a 60% removal efficiency. This does not include the small contribution from the secondary influent channel or the senior citizen's home, so there may be some small variance in removal efficiency. Calculation of removal efficiencies across the clarifier for TSS, TOC, ammonia nitrogen (NH_3-N), nitrate&nitrite nitrogen (NO_2&NO_3-N), and total-phosphorus (total-P) include the weighted results of grab samples from the secondary influent and should produce more accurate estimates. Weight coefficients were determined from the relative flows of each influent channel. TSS decreased from an estimated 98 mg/L (weighted composite and grab results) to 38 mg/L, for a removal efficiency of 61%. Removal efficiencies for TOC, NH_3-N, and total-P were 7%, 19%, and 18% respectively. NO_2&NO_3-N loads increased by a factor of 7.8.

The total BOD_5 removal efficiency was 50% greater than the high end of the range expected from typical primary sedimentation systems (Metcalf & Eddy, 1991), which supports the efficiency of the alum treatment in removing organic constituents. In contrast, TSS removal efficiencies were well within the typical range and the effect of the alum treatment on this parameter appeared to be marginal. This is an unexpected result and would suggest that the alum treatment may have been reacting with and removing a portion of the dissolved BOD_5. This is supported by the difference between total solids (TS) removal and TSS removal across the clarifier, indicating a 30 mg/L reduction in total dissolved solids (TDS).

Treatment Plant Effluent

Ecology results for the $CBOD_5$ concentrations showed a reduction across the entire treatment plant from 104 mg/L in the influent (compositor result only) to 15 mg/L in the final effluent, for a 86% removal efficiency. The BOD_5 results also showed an 86% removal efficiency. TSS decreased from 98 mg/L to 5 mg/L in the final effluent, with a removal efficiency of 95% across the entire system. Removal efficiency across the plant for TOC was 73%. Ammonia nitrogen was reduced from an estimated 10.1 to 2.7, also for a reduction of 73%. Total phosphorous were reduced 93% and NO_2&NO_3 nitrogen was increased by more than a factor of 20. Chlorine residual concentrations in the grab and composite effluent samples were both 4 mg/L. Due to the volatilization of free chlorine over time, the composite sample result suggests an overall higher chlorine concentration in the final effluent than indicated by the grab result. The influent to effluent pH changed dramatically (hydrogen ion:[H+] increased by a factor of 9), forcing the effluent pH well into the acidic range.

Ecology analyses of the Walla Walla samples displayed slightly greater percent reductions in TSS, $CBOD_5$, total BOD_5, and total-P. Slightly smaller reductions were seen in TOC and NH_3-N and the dramatic change in pH was not observed in the Walla Walla samples. It should be noted that Walla Walla holding temperature for the 24-hour effluent sample was elevated (16° C) and exceeded the 4° C holding temperature recommended for BOD_5 analyses (Ecology, 1991). The Walla Walla effluent pH was also determined from this single composite sample. It is likely that the observed differences, particularly in the $CBOD_5$ and BOD_5 results, were due to this elevated holding temperature.

Ecology data suggest reasonably effective treatment of $CBOD_5$ and BOD_5, and more highly effective treatment of TSS and total-P. Nitrification was also moderately effective. The two grab sample pHs (5.79 & 5.56) were outside the permissible range of 6.5 to 8.5 stipulated for class B water. The change in acidity across the treatment plant is unusual and likely related to the addition of alum.

A mass balance incorporating Washington State Water Quality Standards mixing zone specifications was calculated to project conditional maximum end-of-pipe concentrations which could produce violations of total ammonia criteria at the acute and chronic dilution zone boundaries in Mill Creek during the winter season discharge period (Ecology, 1994). The calculations use an adjusted total ammonia nitrogen criteria, that is based upon the estimated pH and temperature at the edge of the acute and chronic dilution zones determined from samples collected during the Class II inspection (September 17, 1996). Since the permit dilution factor was close to unity and receiving water values were slightly higher than whole effluent values, pH and temperature values at the edge of the acute and chronic zones were very close to the whole effluent values. The receiving water ammonia nitrogen concentration was also analyzed and found to be 0.014 mg/L. The maximum allowable whole effluent ammonia nitrogen concentrations were calculated to be 26.4 mg/L and 1.80 mg/L for the acute and chronic criteria respectively. The whole effluent ammonia nitrogen concentration (2.70 mg/L), determined from the Ecology 24-hour composite sample, would exceed allowable chronic concentration in Mill Creek by 50%.

Although during the inspection effluent was diverted to the irrigation district and ammonia and pH levels were not directly applicable to water quality standards, the measured effluent concentrations could have exceed water quality criteria for these parameters if discharged to Mill Creek. Walla Walla should ensure that effluent concentrations will not exceed these water quality criteria during the critical December through May discharge season.

NPDES Permit Comparisons

Table 3 compares inspection results to NPDES permit limits. During the inspection the permit limits for diversion of effluent to Blalock and Gose irrigation districts were in

effect. Permit limits for discharge to Mill Creek are also included for tentative comparison. The Ecology composite 24-hour effluent BOD_5 concentration (≥17 mg/L) exceeded the irrigation district discharge (June to November) permitted monthly average limit (12 mg/L) by 42%, and was 94% of the weekly average limit. Due to uncertainty about the upper boundary of the BOD_5 result, this concentration may exceed the weekly average limit (18 mg/L). The effluent 24-hour composite BOD_5 load (≥835 lb/day) was within NPDES permitted monthly average and weekly average effluent load limits. The percent reduction across the treatment plant (≥86%) was 1% greater than the minimum monthly average reduction (85%) required by the permit, and since the effluent BOD_5 concentration could be higher this percent reduction might be less than the minimum monthly average reduction. There is some additional uncertainty, since the influent concentration used to calculate percent reduction does not factor in the secondary influent channel BOD_5 concentration. However, due to the secondary channel's relatively low flow it is unlikely that it would appreciably change the final influent result. The Walla Walla effluent BOD_5 result (≤4 mg/L) was within the permitted limit, but due to the elevated holding temperature encountered in the Walla Walla sample the Ecology result is deemed more reliable.

The Ecology 24-hour composite effluent TSS concentration (5 mg/L) and load (246 lb/day) were well within the monthly and weekly average permitted limits. Percent reduction across the plant (95%) was greater than the 85% monthly average reduction required by the permit. The TSS result was also much less than the Mill Creek discharge limits. The Walla Walla sample TSS concentration and load gave slightly more favorable results than the Ecology comparisons.

The two effluent grab fecal coliform results (both: ≤ 1 colonies/100 ml) were below the monthly average permit limit (2.2 colonies/100 ml), and the turbidity result (4.6 NTU) was within the both the monthly and weekly averages. The pH results for all Ecology grab samples were substantially less than the low end of the irrigation district discharge permitted range (6.5 to 9.0). The reported totalized average influent flow of 5.89 MGD was well below the NPDES permit monthly average wet and dry weather design flows of 9.8 MGD and 10.8 MGD respectively. Influent BOD_5 and TSS loads were well below the permitted peak load limits.

A total residual chlorine concentration in the effluent (4.0 mg/L) is considered to be rather high. A narrative limitation for chlorine during the irrigation season discharge stipulates that total residual chlorine shall be maintained at a concentration sufficient to attain the permitted total fecal coliform limits, but shall avoid chlorine concentrations in excess of that necessary to reliably achieve those limits. With a fecal coliform density below the detect limit, it is likely that total residual chlorine concentration in the effluent was in excess of that which was necessary to achieve the permit limits. The high residual concentrations suggests that the treatment plant's dechlorination system was not functioning properly. Walla Walla should evaluate their chlorine treatment system to

determine strategies that will allow them to conform to the narrative chlorine permit limit.

Conditional comparisons of inspection results (irrigation season: June through November) to the Mill Creek discharge permit limits (winter season: December through May), although not in effect at the time of the inspection, found the 24-hour effluent total ammonia nitrogen load (133 lb/day) would exceed the Mill Creek discharge monthly average permit load limit by 48%. The ammonia nitrogen load would be within the weekly average load limit. The Ecology grab pH results would be outside the Mill Creek discharge permitted pH range. The whole effluent total residual chlorine result (4 mg/L) would exceed the permitted monthly average limit and the weekly average limit by a factor of 1000 and 200 respectively. The Ecology 24-hour $CBOD_5$ concentration would exactly equal the $CBOD_5$ limit for the Mill Creek discharge period. Effluent copper and zinc concentrations would be both below the Mill Creek discharge permitted monthly and weekly average limits. It should be noted that the copper concentration was 96% of this monthly average limit.

Walla Walla should ensure that $CBOD_5$ and BOD_5 concentrations remain within permitted limits during all discharge periods and that minimum percent reductions across the plant are achieved. The low pH in the effluent is of particular concern and Walla Walla should determine its cause and ensure that the future effluent pH remains within the permitted range. Although permitted ammonia and chlorine limits specific to the Mill Creek discharge did not apply during the inspection, caution should be exercised to ensure that the effluent chlorine and ammonia concentrations do not exceed permit limits during that period.

Detected Priority Pollutant Organics and Metals

Table 4 summarizes concentrations of organic and metal parameters detected with priority pollutant scans. Appendix E contains results of all targeted organic compounds and metals results. Tentatively identified compounds are presented in appendix F. A glossary is included in appendix G.

Predicated on discharge to Mill Creek, effluent results were conditionally compared to water quality criteria. Three VOA compounds and one BNA compound were detected in the 24-hour composite effluent sample. Results did not exceed freshwater acute and chronic water quality criteria. One pesticide compound, gamma-BHC, was detected in the effluent at 0.15 µg/L. This concentration exceeds the chronic freshwater quality criteria (0.08 µg/L) by a factor of 2 and the EPA human health criteria (0.0190 µg/L) by a factor of 8. Dilution in Mill Creek would not be sufficient to mitigate these exceedences.

Four priority pollutant metals were detected in the plant effluent. Lead (1.9 µg/L-estimated) exceeded the freshwater chronic water quality criteria in the whole effluent (EPA, 1986). Dilution during discharge to Mill Creek would not be sufficient to reduce

the concentration to within the chronic criteria. Copper (6.7 µg/L), cadmium (0.12 µg/L), and zinc (34 µg/L) were all within both acute and chronic water quality limits.

Although the effluent was diverted to the irrigation district during the inspection, Walla Walla should ensure that gamma-BHC and lead concentrations remain within water quality limits during periods of discharge to Mill Creek. The impact of these concentrations on surface waters due to runoff from irrigation should also be evaluated.

Agronomic Analysis

Comparisons of effluent concentrations to water quality guidelines for irrigation are included in Table 5. The effluent pH was outside the normal range that allows no restrictions on use, which suggests that damage to crops might result from applications of Walla Walla effluent as sampled during the inspection. The acidic pH was likely due to the presence of alum, and the problem was presumably limited to the period of alum addition. The effluent adjusted sodium adsorption ratio (R_{na}) lay in a range from 3-6, indicating that an effluent electrical conductivity (EC_w) of 0.40 mmho/cm would create a sight to moderate inhibition on the infiltration rate of wastewater into the soil. This could produce a deleterious effect on crops irrigated with the Walla Walla effluent. Ion toxicity related to boron and sodium concentrations (0.146 mg/L & 27.6 mg/L respectively) would result in no restrictions on irrigation use. Concentrations of trace elements were all well below minimum levels found to affect sensitive crops. Ec_w and TDS concentrations were found to be well below the levels associated with salinity effects, which would adversely affect crop water availability. Miscellaneous effects by effluent HCO_3 and Kjeldahl nitrogen were less than minimum concentrations which affect certain susceptible crops. Minimum range of acreage (alfalfa) required for uptake of the effluent's nitrogen and phosphorus concentrations would be 133-318 acres and 139-209 acres respectively. Food crops such as barley and wheat would take substantially greater acreage. It should be noted that area farmers have adjudicated water rights to the Walla Walla treatment plant effluent. Walla Walla should evaluate the impacts effluent concentrations are having on cropland irrigated with their discharge.

Sludge

General Chemistry

General chemistry sludge results are presented in Table 1. The sludge dry weight fecal coliform density was 136 #/gram (1,100 colonies - MPN: most probable number - per 100 grams wet wt.). The dry weight result is well below the maximum limit for fecal coliform density of 1000 #/g dry wt. as required for Class A sewage sludge land application (EPA, 1993).

Detected Priority Pollutants

Eleven metals were detected in the sludge (Table 4). The selenium concentration (64 mg/Kg-dry wt.) exceeded the pollutant concentration limit specified in the EPA standards for land application of sewage sludge (Table 6 - EPA, 1993). Although none of the following exceed EPA land application standards, other metal concentrations of note included zinc (1140 mg/Kg-dry), copper (406 mg/Kg-dry), chromium (305 mg/Kg-dry), lead (157 mg/Kg-dry), and mercury (5.09 mg/Kg-dry). All metal concentration were within screening limits for the dangerous waste designation criteria (Table 6). Walla Walla should ensure that selenium concentrations in the sludge are within the EPA limits before application to agricultural land, forest land, public contract site, or reclamation site.

Split Samples

Sample Comparisons

Ecology analysis of samples collected by Ecology and Walla Walla produced dissimilar results (Table 7). The Walla Walla influent and effluent BOD_5 and $CBOD_5$ results were substantially less than Ecology results. In contrast Walla Walla influent TSS concentrations were substantially higher. Relative percent differences (RPD) between these pairs of TSS, BOD_5, and $CBOD_5$ samples were all greater than the maximum variation in precision cited in the EPA comparison of interlaboratory analysis of selected parameters (EPA, 1983). The differences in BOD_5 and $CBOD_5$ results were likely due to the elevated holding temperatures of the Walla Walla samples. The higher Walla Walla TSS results could also be related to an elevated holding temperature, although less exact sampling techniques may also contribute to the difference. Walla Walla should maintain their influent and effluent at the proper holding temperature. They should review sampling techniques to ensure representative samples.

Ecology and Walla Walla fecal coliform results were identical. Although no grab sample pH results from Walla Walla were provided for comparison to Ecology grab samples, during the inspection it was observed that the Walla Walla laboratory staff used a buffer range of from 4.00 to 10.00 for the calibration of their Orion pH meter. This large calibration range might produce errors in Walla Walla pH measurements. Walla Walla should review proper calibration technique and ensure that pH readings are accurate.

Laboratory Comparisons

Ecology and Walla Walla laboratory results for influent samples collected by Walla Walla were extremely close, with RPDs between samples well below the maximum variation in precision cited in the EPA comparison of interlaboratory analysis. This would suggest that the Walla Walla laboratory performance was good.

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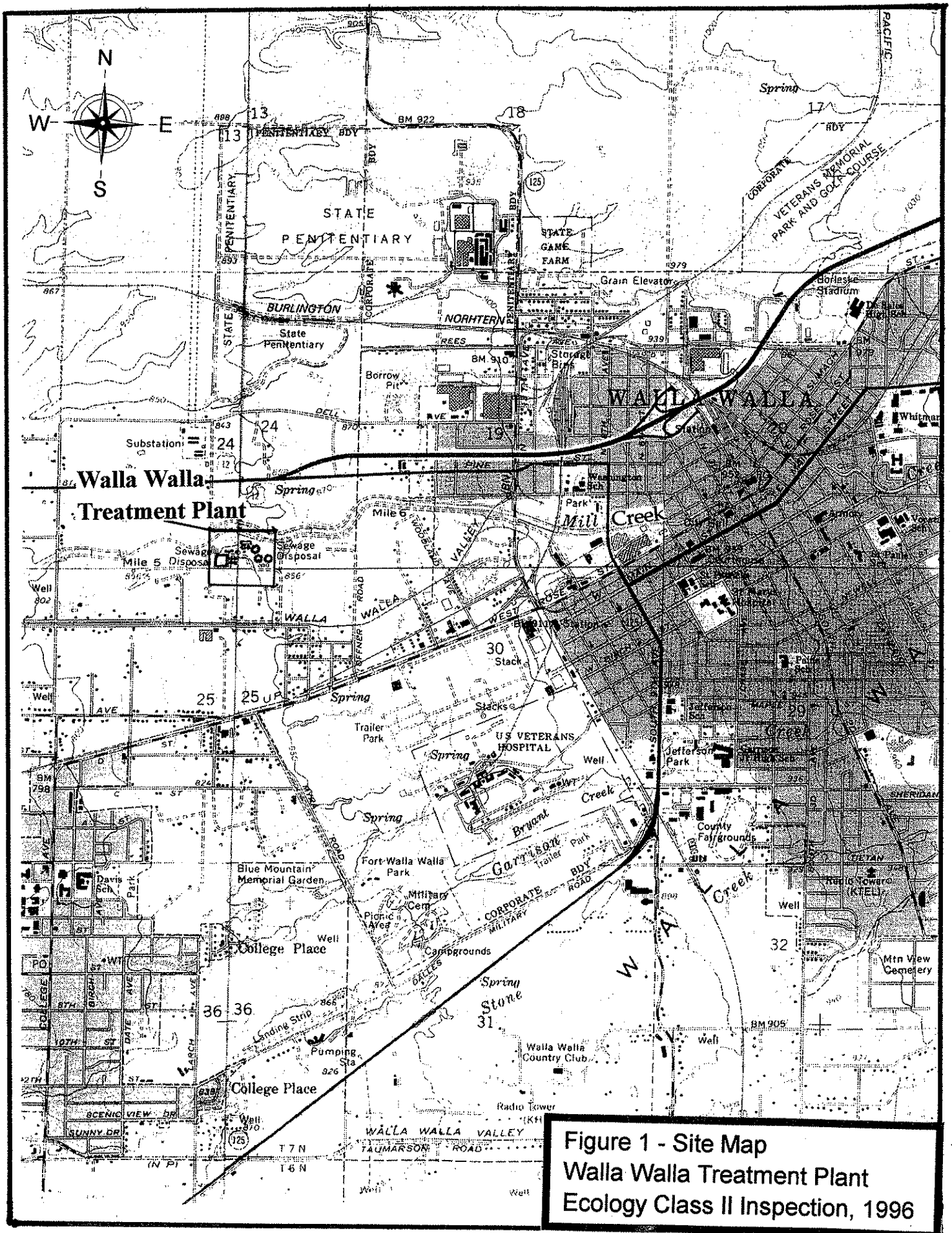

Figure 1 - Site Map
Walla Walla Treatment Plant
Ecology Class II Inspection, 1996

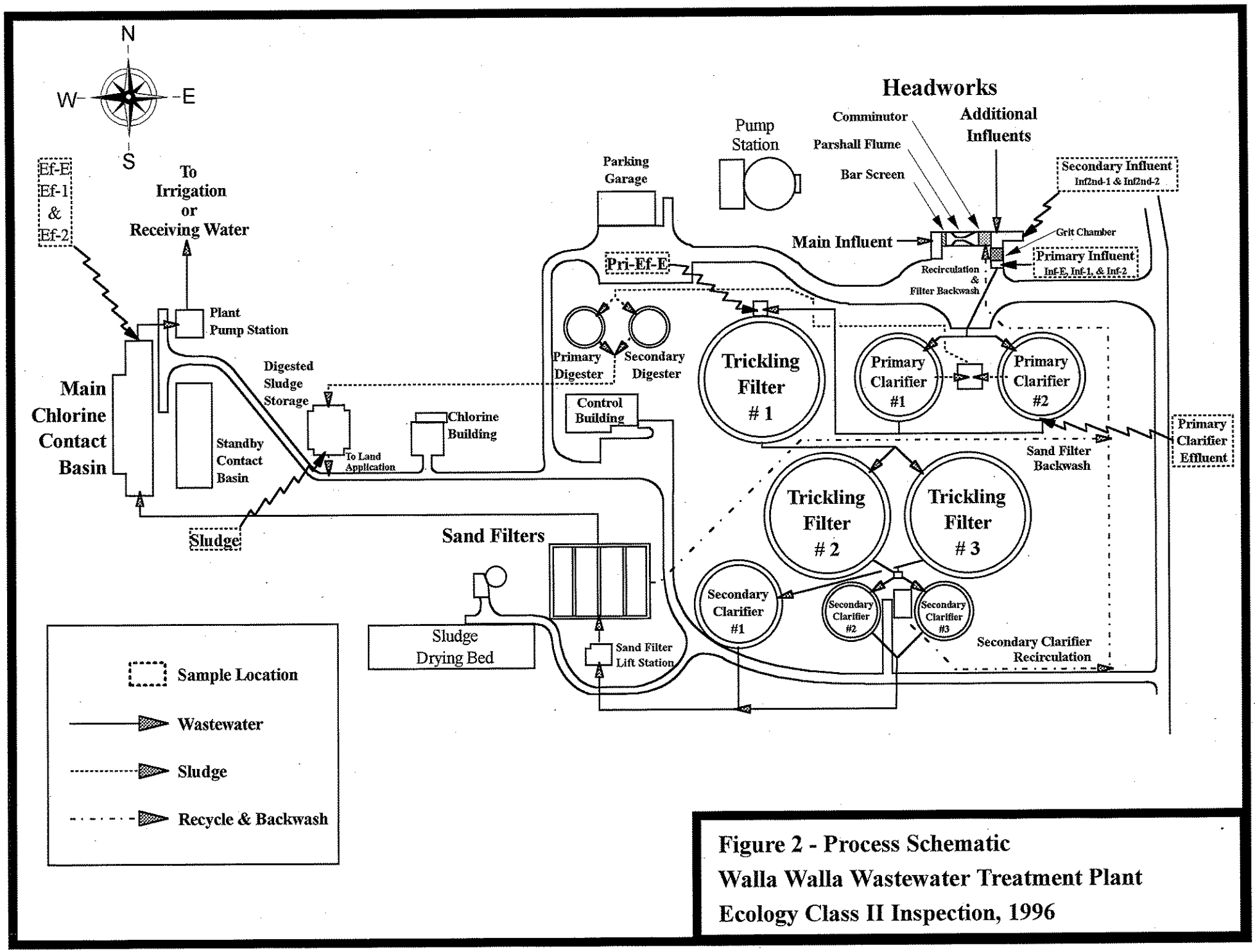

Figure 2 - Process Schematic
Walla Walla Wastewater Treatment Plant
Ecology Class II Inspection, 1996

Table 1 - General Chemistry Results - Walla Walla Class II Inspection, 1996.

Parameter	Location:	Inf-1	Inf-2	Inf-E	Inf-W[2]	Inf2nd-1	Inf2nd-2	PriEf-E
	Type:	grab	grab	comp	comp	grab	grab	comp
	Date:	9/17	9/17	9/17-18	9/17-18	9/17	9/17	9/17-18
	Time:	09:50	15:40	11:50-1150	08:00-08:00	1225	1555	1650-1650
	Lab Log #:	388235	388231	388232	388233	388244	388245	388234
GENERAL CHEMISTRY								
Turbidity (NTU)								
Conductivity (umhos/cm)		359	366	344	347	447	405	359
Alkalinity (mg/L CaCO3)				121	90.4			77.8
Hardness (mg/L CaCO3)				64.5	66.6			63.2
SOLIDS								
TS (mg/L)				359	366			272
TNVS (mg/L)				172	196			178
TSS (mg/L)		122	102	95	136	136	151	38
TNVSS (mg/L)				13	30			12
% Solids								
% Volatile Solids								
OXYGEN DEMAND PARAMETERS								
BOD5 (mg/L)				118	81			47
CBOD5 (mg/L)				104				
TOC (water mg/L)		55.1	46.6	46.6	25.2	74.7	65.7	44.9
TOC (soil %-dry wt.)								
NUTRIENTS								
Total Kjeldahl Nitrogen (TKN) (mg/L)								
NH3-N (mg/L)		10	9.82	9.58	8.52	22.1	15	8.24
NO2+NO3-N (mg/L)		0.057	0.043	0.314	0.01 U	0.01 U	1.01	2.46
Total-P (mg/L)		3.12	3.3	3.13	4.62	4.02	3.76	2.61
MISCELLANEOUS								
F-Coliform MF (#/100mL)								
T-Coliform MF (#/100mL)								
F-Coliform (soil/sed - #/100gm)								
Cyanide total (ug/L)								
Cyanide (wk & dis ug/L)								
HCO3 (mg/L)								
Boron (ug/L)								
Ca (ug/L)								
Mg (ug/L)								
Na (ug/L)								
FIELD OBSERVATIONS								
Temperature (°C)		18.5	20.2			18.5	18.6	7.2
Temp-cooled (°C)				7.9	16			
pH		6.6	6.62	7.35	6.31	6.79	6.73	7.45
Conductivity (umhos/cm)		378	336	362	360	458	421	639
Chlorine (mg/L)		≤0.01						

E	Ecology sample	Inf	Main influent sample	comp	composite sample
W[2]	Walla Walla sample	Eff	Effluent sample	Inf2nd	Secondary influent sample
grab	grab sample	PriEf	Primary clarifier effluent		
-+	Refrigerated sample	U	The analyte was not detected at or above the reported result.		

Table 1 - General Chemistry Results - Walla Walla Class II Inspection, 1996.

Parameter	Location:	Eff-1	Eff-2	Eff-E	Eff-W[2]	Eff-3	Eff-4	Eff-5	Sludge	RcvWtr
	Type:	grab	grab	comp	comp	grab	grab	grab	grab	grab
	Date:	9/17	9/17	9/17-18	9/17-18	9/17	9/17	9/17	9/17	9/17
	Time:	11:05	14:50	08:55-08:55	08:00-08:00	11:05	14:50	1630	11:50	14:15
	Lab Log #:	388235	388236	388237	388238	388239	388240	388246	388241	388242
GENERAL CHEMISTRY										
Turbidity (NTU)				4.6	6.1					
Conductivity (umhos/cm)		340	337	394	346					
Alkalinity (mg/L CaCO3)				15.6	15.4					
Hardness (mg/L CaCO3)				64.4	64.8					75.7
SOLIDS										
TS (mg/L)				259	278					
TNVS (mg/L)				182	162					
TSS (mg/L)		4	5	5	4					2
TNVSS (mg/L)				3	2					
% Solids									8.1	
% Volatile Solids									3.8	
OXYGEN DEMAND PARAMETER										
BOD5 (mg/L)				17 G	4 U					
CBOD5 (mg/L)				15	8 U					
TOC (water mg/L)		6.9	6.6	13	8					
TOC (soil %-dry wt.)									25.7	
NUTRIENTS										
Total Kjeldahl Nitrogen (TKN) (mg/L)				3.63	3.68					
NH3-N (mg/L)		2.8	3.96	2.7	2.9					0.014
NO2+NO3-N (mg/L)		8.22	8.03	7.63	7.6					
Total-P (mg/L)		0.13	0.185	0.238	0.232					
MISCELLANEOUS										
F-Coliform MF (#/100mL)						1 U	1 U	1 U		
T-Coliform MF (#/100mL)							1 U	1 U		
F-Coliform (soil/sed - #/100gm)									1100	
Cyanide total (ug/L)		0.04								
Cyanide (wk & dis ug/L)		0.02								
HCO3 (mg/L)				15.6						
Boron (ug/L)				146						
Ca (ug/L)				14900						
Mg (ug/L)				5860						
Na (ug/L)				27600						
FIELD OBSERVATIONS										
Temperature (°C)		17.2	19.0			17.2	19.0	18.8		20.0
Temp-cooled (°C)*				5.2	11.5					
pH		5.79	5.56	5.69	6.22	5.79	5.56	5.88		7.47
Conductivity (umhos/cm)		353	349	364	356	353	349	351		191
Chlorine (mg/L)		4.0		4.0		4.0				

E	Ecology sample	Sludge	Digested sludge sample	comp	composite sample
W[2]	Walla Walla sample	RcvWtr	Receiving water sample	-+	Refrigerated sample
grab	grab sample	G	Greater than or equal to the estimate value.		
Eff	Effluent sample	U	The analyte was not detected at or above the reported result.		

Table 2 - General Chemistry Percent Reduction Results - Walla Walla Class II Inspection, 1996.

Parameter	Location:	Inf-E	Inf2nd-1	Inf2nd-2	Weighted Influent Concentration+	PriEf-E	Ecology Percent Reduction In Load Across Primary Clarifier *	Eff-E	Ecology Percent Reduction In Load Across Treatment Plant*	Inf-W2	Eff-W2	Walla Walla Percent Reduction In Load Across Treatment Plant**
	Type:	comp	grab	grab		comp		comp		comp	comp	
	Date:	9/17-18	9/17	9/17		9/17-18		9/17-18		9/17-18	9/17-18	
	Time:	1150-1150	1225	1555		1650-1650		08:55-08:55		0800-0800	0800-0800	
	Lab Log #:	388232	388244	388245		388234		388237		388233	388238	
GENERAL CHEMISTRY												
Conductivity (umhos/cm)		344	447	405	349	359	-3% +	394	-13% +	347	346	0%
Alkalinity (mg/L CaCO3)		121				77.8	36%	15.6	87%	90.4	15.4	83%
Hardness (mg/L CaCO3)		64.5				63.2	2%	64.4	0%	66.6	64.8	3%
SOLIDS												
TS (mg/L)		359				272	24%	259	28%	366	278	24%
TNVS (mg/L)		172				178	-3%	182	-6%	196	162	17%
TSS (mg/L)		95	136	151	97.9	38	61% +	5	95% +	136	4	97%
TNVSS (mg/L)		13				12	8%	3	77%	30	2	93%
OXYGEN DEMAND PARAMETERS												
BOD5 (mg/L)		118				47	60%	17 G	86%	81	4 U	95%
CBOD5 (mg/L)		104						15	86%		8 U	92%
TOC (water mg/L)		46.6	75	65.7	48.0	44.9	7% +	13	73% +	25.2	8	68%
NUTRIENTS												
NH3-N (mg/L)		9.58	22	15	10.1	8.24	19% +	2.7	73% +	8.52	2.9	66%
NO2+NO3-N (mg/L)		0.314	0.01 U	1.01	0.33	2.46	-654% +	7.63	≥ -2238% +	0.01 U	7.6	
Total P (mg/L)		3.13	4	3.8	3.18	2.61	18% +	0.238	93% +	4.62	0.232	95%
FIELD OBSERVATIONS												
pH		7.35	6.79	6.73	7.28	7.45	21% #	5.69	-4471% #	6.31	6.22	-23% #
Conductivity (umhos/cm)		362	458	421	367	639	-74% +	364	1% +	360	356	1%

E Ecology sample
W2 Walla Walla sample
comp composite sample
-+ Refrigerated sample
Based on hydrogen ion concentration
G Greater than or equal to the estimate value.
Inf2nd Secondary Influent sample
Inf Primary Influent sample
Pri Primary clarifier effluent
Eff Effluent sample
· indicates percent increase.

* Ecology influent, primary clarifier, and effluent loads were based on sample periods which were not completely sychronized. Estimated influent , primary clarifiers, and effluent flows were 5.89, 5.88, an 5.89 MGD respectively.

** Walla Walla Influent and effluent loads based on sample periods which were sychronized. Estimated influent and effluent flows were both 5.89 MGD.

\+ Influent loads calculated from flow weighted primary and secondary influent concentrations, where the secondary to primary ratio is 113 x 1000gal/1960 x 1000 gal and secondary grabs are averaged.

Table 3 - NPDES Comparison Results -Walla Walla Class II Inspection, 1996.

Comparisons to Effluent Limitations for Discharge to Blalock & Gose Irrigation Districts (Effective: June -November)

Parameter	NPDES Permit Effluent Limits		Inspection Results						
			Ecology Composites		Walla Walla Composites		Ecology Grabs		
	Monthly Average	Weekly Average	Location: Inf-E	Eff-E	Inf-W²	Eff-W²	Eff-1	Eff-2	Eff-4	Eff-5
			Type: comp	comp	comp	comp	grab	grab	grab	grab
			Date: 9/17-18	9/17-18	9/17-18	9/17-18	9/17	9/17	9/17	9/17
			Time: 11:50-1150	08:55-08:55	08:00-08:00	08:00-08:00	11:05	14:50	14:50	1630
			Lab Log #: 388232	388237	388233	388238	388235	388236	388240	388246
Effluent Biochemical Oxygen Demand (BOD_5)										
Concentration: (mg/L)	12	18		≥ 17 G		4 U				
Loading: (lbs/day)	981	1472		≥ 835.1 *#		196 ***				
Percent Reduction	≥85% Monthly averages shall not exceed 15% of influent monthly average			≥ 86% #		95%				
Effluent TSS										
Concentration (mg/L)	10	15		5		4	4	5		
Loading: (lbs/day)	817	1226		245.6 *		196 ***				
Percent Reduction	≥85% Monthly averages shall not exceed 15% of influent monthly average			95% +		98%				
Effluent Total Coliform										
Concentration (count/100 mL)	2.2								1 U	1 U
Effluent Turbidity										
Concentration (NTU)	17	25		4.6		6.1				
Effluent pH										
(S.U.)	6.0 < pH < 9.0						5.97	5.56	5.56	5.88

Influent Design Limits

	Monthly Average Wet Weather Flow	Monthly Average Dry Weather Flow	Peak Flow				
Influent Flow Limits (MGD)							
	9.8	10.8	15		5.89 **	5.89	
Influent BOD_5 ($CBOD_5$) Loading Limits			Peak Load				
(mg/L)					118 # (104)#	81	
(lbs/day)			8,130		5,796 (5,109)**	3,979 ***	
Influent TSS Loading Limits			Peak Load				
(mg/L)					95	136	
(lbs/day)			8,440		4,667 **	6,681 ***	

E	Ecology 4-hour composite sample
W²	Walla Walla 24-hour composite sample
Inf	Influent sample
Eff	Effluent sample
comp	Composite sample
grab	Ecology grab sample.
Eff-4&5	Ecology effluent coliform samples collected on 9/17

*	Load calculated from estimated flows of 5.89 MGD recorded during Ecology effluent composite sampling period.
**	Load calculated from estimated flows of 5.89 MGD recorded during Ecology influent composite sampling period.
***	Load calculated from estimated flows of 5.89 MGD recorded during Walla Walla composite sampling period.
+	Influent load calculated from flow weighted primary and secondary influent concentrations, where the secondary to primary ratio is 113 x 100gal/1960 x 1000 gal and the secondary influent TSS concentration averages 144 mg/L.
#	Influent load based on primary influent channel only
G	Greater than or equal to the estimate value.

Table 3 - NPDES Comparison Results -Walla Walla Class II Inspection, 1996.

Tentative Comparisons to Effluent Limitations for Discharge to Mill Creek (Effective: December - May)

Parameter	NPDES Permit Effluent Limits		Inspection Results							
			Ecology Composites		Walla Walla Composites		Ecology Grabs			
	Monthly Average	Weekly Average	Location: Inf-E	Eff-E	Inf-W[2]	Eff-W[2]	Eff-1	Eff-2	Eff-4	Eff-5
			Type: comp	comp	comp	comp	grab	grab	grab	grab
			Date: 9/17-18	9/17-18	9/17-18	9/17-18	9/17	9/17	9/17	9/17
			Time: 11:50-1150	08:55-08:55	08:00-08:00	08:00-08:00	11:05	14:50	14:50	1630
			Lab Log #: 388232	388237	388233	388238	388235	388236	388240	388246
Effluent Carbonaceous Biochemical Oxygen Demand ($CBOD_5$)										
Concentration: (mg/L)	15	22		15		8 U				
Loading: (lbs/day)	1261	1892		736.8 *#		393 ***				
Percent Reduction	≥85% Monthly averages shall not exceed 15% of influent monthly average			86% #		90%				
Effluent TSS										
Concentration (mg/L)	30	45		5		4	4	5		
Loading: (lbs/day)	1266	1899		245.6 *		196 ***				
Percent Reduction	≥85% Monthly averages shall not exceed 15% of influent monthly average			95% +		98%				
Effluent Fecal Coliform										
Concentration (count/100 mL)	200	400							1 U	1 U
Effluent Total Residual Chlorine										
Concentration (µg/L)	4	19		4,000			4,000			
Effluent Total Ammonia										
Concentration (µg/L)				2.7						
Loading (µg/L)	90	150		132.6						
Effluent pH										
(S.U.)	6.0 < pH < 9.0						5.97	5.56	5.56	5.88
Effluent Copper										
Concentration (µg/L)	7	13		6.7						
Effluent Zinc										
Concentration (µg/L)	44	89		34						

E	Ecology 4-hour composite sample
W^2	Walla Walla 24-hour composite sample
Inf	Influent sample
Eff	Effluent sample
comp	Composite sample
grab	Ecology grab sample.
Eff-4&5	Ecology effluent coliform samples collected on 9/17

*	Load calculated from estimated flows of 5.89 MGD recorded during Ecology effluent composite sampling.
***	Load calculated from estimated flows of 5.89 MGD recorded during Walla Walla composite sampling.
+	Influent load calculated from flow weighted primary and secondary influent concentrations, where the secondary to primary ratio is 113 x 100gal/1960 x 1000 gal and the secondary influent TSS concentration averages 144 mg/L.
#	Influent load based on primary influent channel only
U	The analyte was not detected at or above the reported result.

Table 4 - Detected Priority Pollutant Organics and Metals Results - Walla Walla Class II, 1996

Parameter	Location:	Eff-1	Eff-2	Water Quality Criteria		
	Type:	grab	grab	Fresh Acute	Fresh Chronic	
	Date:	9/17	9/17			
	Time:	11:05	14:50			
	Lab Log #:	38823	388236			
VOA Compounds		µg/L	µg/L	µg/L	µg/L	
Acetone			3 J			
Chloroform		1.8	2.1	28900 *	1240 *	
Bromodichloromeths		0.65 J	0.58 J	11000 *(a		

Parameter	Location:	Eff-E	Water Quality Criteria		
	Type:	comp	Fresh Acute	Fresh Chronic	
	Date:	9/17-18			
	Time:	08:55-08:55			
	Lab Log #:	388237			
BNA Compounds		µg/L	µg/L	µg/L	
Phenol		0.35	10200 *	2560 *	

Parameter	Location:	Eff-E	Water Quality Criteria		
	Type:	comp	Fresh Acute	Fresh Chronic	
	Date:	9/17-18			
	Time:	08:55-08:55			
	Lab Log #:	388237			
Pesticide/PCB Compounds		µg/L	µg/L	µg/L	
Gamma-BHC		0.15	2	0.08	

Parameter	Location:	Eff-E	TrnsBlk	Water Quality Criteria		Sludge
	Type:	comp	grab	Fresh Acute	Fresh Chronic	grab
	Date:	9/17-18	9/16			9/17
	Time:	08:55-08:55	18:20			11:50
	Lab Log #:	388237	388243			388241
Metal Compounds		µg/L	µg/L	µg/L	µg/L	mg/Kg-dry wt.
Hardness =	75.7					
Arsenic						24.7 J
Pentavalent				850 *	48.0 *	
Trivalent				360	190	
Beryllium				130 *	5.30 *	0.22
Cadmium		0.12	0.12	2.48 +	0.79 +	4.04
Chromium						305
Hexavalent				16.0	11.0	
Trivalent				1382 +	165 +	
Copper		6.7		11.75 +	8.03 +	406
Lead		1.9 J		39.4 +	1.53 +	157
Mercury				2.40	0.01	5.09
Nickel				1065 +	118 +	17.1
Selenium				20	5.0	64.0
Silver				1.34 +	0.12	30.2 J
Zinc		34	8.1	82.4 +	74.6 +	1140

Inf	Influent sample	J	The analyte was positively identified. The associated numerical result is an estimate.
E	Ecology sample	*	Insufficient data to develop criteria. Value presented is the LOEL - Lowest
grab	Grab sample		Observed Effect Level.
comp	Composite sample	+	Hardness dependent criteria (75.7 mg/L - receiving water hardness used).
Ef	Effluent sample	a	Total Halomethanes
Sludge	Sludge sample		

Table 5 - Comparisons to Water Quality Guidelines for Irrigation - Walla Walla Class II 1996

Parameter	Location: Ef-E Type: comp Date: 09/17-18 Time: 8:55-8:55 Lab Log #: 388237	Degree of Restriction on Use		
		None	Slight to Moderate	Severe
Specific Ion Toxicity - Sprinkler Irrigation (affects sensitive crops)				
Boron (mg/L)	0.146	< 0.7	0.7 - 3.0	> 3
Sodium (mg/L)	27.6	< 70	> 70	
Trace Elements				
As (arsenic - mg/L)	0.003 U	< 0.1		
Be (beryllium - mg/L)	0.001 U	< 0.1		
Cd (cadmium - mg/L)	0.00012 P	< 0.01		
Cr (chromium - mg/L)	0.005 U	< 0.1		
Cu (copper - mg/L)	0.0067	< 1		
Ni (nickel - mg/L)	0.01 U	< 0.2		
Pb (lead - mg/L)	0.0019 J	< 5		
Se (selenium - mg/L)	0.0015 U	< 0.02		
Zn (zinc - mg/L)	0.034	< 2		
Salinity (affects crop water availability)				
EC_w * (mmho/cm)	0.40	< 0.7	0.7-3.0	> 3
TS (mg/L)	259			
TSS (mg/L)	5			
TDS (mg/L)**	254	< 450	450-2,000	> 2000
Miscellaneous Effects (affects susceptible crops)				
pH	5.79	Normal range: 6.5-8.4		
HCO3 (mg/L)	15.6	< 90	90-500	> 500
Total Kjeldahl N (mg/L)	3.63	< 5	5-30	> 30
Permeability (affects infiltration rate of wastewater into soil)				
Ca (mg/L)	14.9			
Ca_X	3.87			
Na (mg/L)	27.6			
Mg (mg/L)	5.86			
EC_w * (mmho/cm)	0.40			
adj R_{Na} (for sample)	0.78			
adj R_{Na} (evaluate using EC_w and adj R_{Na})	Range: 3-6	For EC_w ≥0.7	0.7-0.2	< 0.2

Nutrient Uptake		Minimum Range of Acreage Required for Nutrient Uptake For Selected Crops (Acres)			
		Alfalfa	Barley	Wheat	Fir
Nitrogen (lb/year)	63648	133-318	1010	796 -1273	289-472
Phosphorus (lb/year)	4173	139-209	278	278	

EC_w	Electrical conductivity of irrigation water	U	The analyte was not detected at or above the reported result.
adj RNa	Adjusted sodium adsorption ratio	P	The analyte was detected above the instrument detection limit, but below the minimum established quanitation limit.
Ef	Effluent sample	J	The analyte was positively identified. The associated numerical result is an estimate.
E-comp	Ecology composite sample		
*	Represents irrigation water salinity		
**	TDS = TS - TSS		

Table 6 - Sludge Result Comparisons to the EPA Land Application Concentration Criteria and to the Dangerous Waste Concentration Thresholds- Walla Walla Class II, 1996

Parameter	Location: Sludge Type: grab Date: 09/17/96 Time: 11:50 Lab Log #: 388241	Volumetric Concentration of Parameters@	EPA Standards for Land Application of Sewage Sludge		Dangerous Waste Regulations Designation Criteria	
			Ceiling Concentrations *	Pollutant Concentrations **	Toxicity Characteristics List +	Screening Concentrations# (20 Times)
Metals	(mg/Kg-dry wt.)	(mg/L)	(mg/Kg-dry wt.)	(mg/Kg-dry wt.)	(mg/L)	(mg/L)
Arsenic	24.7 J	**2.02**	75	41	5.0	**100.0**
Cadmium	4.04	**0.33**	85	39	1.0	**20.0**
Chromium (Total)	305	**24.9**	3000	1200	5.0	**100.0**
Copper	406	**N.A.**	4300	1500		**N.A.**
Lead	157	**12.8**	840	300	5.0	**100.0**
Mercury (Total)	5.09	**0.42**	57	17	0.2	**4.0**
Nickel	17.1	**N.A.**	420	420		**N.A.**
Selenium	64.0	**5.23**	100	36	1.0	**20.0**
Silver	30.2 J	**2.47**	N.A.	N.A.	5.0	**100.0**
Zinc	1140	**N.A.**	7500	2800		**N.A.**

* Ceiling concentration limit for sewage sludge.

** Monthly average pollutant concentration limit for sewage sludge.

\+ Maximum concentration of the contaminates for the leachate extract toxicity characteristic.

\# Screening concentration criteria of parameter which recommends that such wastes be designated by test methods set forth in WAC 173-303-110.

@ Wet weight concentration of parameter converted to volumetric concentration assuming a sludge specific gravity of 1.01.

Sludge Walla Walla sludge sample

N.A. Not Applicable

Table 7 - Split Sample Result Comparison - Walla Walla Class II, 1996

	Location:	Inf-E	Inf-W2	Eff-4	Eff-5	Eff-E	Eff-W2
	Type:	comp	comp	grab	grab	comp	comp
	Date:	9/17-18	9/17-18	9/17	9/17	9/17-18	9/17-18
	Time:	11:50-115	08:00-08:00	14:50	1630	08:55-08:55	08:00-08:00
	Lab Log #:	388232	388233	388240	388246	388237	388238
General Chemistry							
Parameter	**Laboratory**						
TSS	Ecology	95	136			5	4
(mg/L)	Walla Walla	104	138			6.5	5.5
BOD5	Ecology	118	81			17 G	4 U
(mg/L)	Walla Walla	122	93				
CBOD5	Ecology	104				15	8 U
(mg/L)	Walla Walla	124	80.4				
Fecal Coliform	Ecology			1 U	1 U		
(#/100ml)	Walla Walla						
Total Coliform	Ecology			1 U	1 U		
(#/100ml)	Walla Walla			1 *			

E	Ecology sample
S	Walla Walla sample
F	Fecal coliform sample
grab	grab sample
comp	Composite sample
*	Walla Walla total coliform sample taken at 10:15 on 9/17/96
Ef	Effluent sample
Inf	Influent sample
G	Greater than or equal to the estimate value.
U	The analyte was not detected at or above the reported result.

Appendices

Appendix A - Sampling Station Descriptions - Walla Walla Class II - September, 1996

Inf-E-#	Ecology grab samples of Walla Walla influent wastewater collected from the primary influent channel above the Parshall flume. Collected 09/17/96 in both A.M. and P.M.
Inf-E	Ecology 24-hour composite sample of Walla Walla influent wastewater collected from the primary influent channel above the Parshall flume. Collected 09/17-18/96
Inf-W[2]	Walla Walla 24-hour composite sample of treatment plant influent wastewater collected from the influent channel just above the Parshall flume. Collected 09/17-18/96
Inf2nd-#	Ecology grab samples of Walla Walla influent wastewater collected from the secondary influent channel above the Parshall flume. Collected 09/17/96 in both A.M. and P.M.
PriEf-E	Ecology 24-hour composite sample of the Walla Walla primary clarifier effluent collected from the second primary clarifier, in its perimeter channel just outside the clarifier weir, at the discharge line to the trickling filters. Collected 09/17-18/96
Ef-E-#	Ecology grab samples of Walla Walla effluent wastewater collected at the end of the main chlorine contact chamber, just prior to final discharge. Collected 09/17/96 in both A.M. and P.M.
Ef-E	Ecology 24-hour composite sample of Walla Walla effluent wastewater collected at the end of the main chlorine contact chamber, just prior to final discharge. Collected 09/17-18/96.
Ef-W[2]	Walla Walla 24-hour composite samples of Walla Walla effluent wastewater collected at the end of the main chlorine contact chamber, just prior to final discharge. Collected 09/17-18/96.
Ef-E-#	Ecology fecal and total coliform grab samples of Walla Walla effluent wastewater collected at the end of the main chlorine contact chamber, just prior to final discharge. Collected 09/17/96 once in the A.M. and twice in the P.M.
Sludge	Ecology grab sample of Walla Walla digested sludge collected from the discharge to the sludge holding tank. - Collected 09/17/96 in the P.M.
Revwtr	Ecology grab sample of Walla Walla receiving water (Mill Creek) taken from the bank of the creek approximately 1/4 mile upstream from the outfall. Collected in the afternoon on 09/17/96.

Appendix B - Sampling Schedule - City of Walla Walla, 1996.

Parameter	Location:	Inf-1	Inf-2	Inf-E	Inf-W[2]	Inf2nd-1	Inf2nd-2	PriEf-E
	Type:	grab	grab	comp	comp	grab	grab	comp
	Date:	9/17	9/17	9/17-18	9/17-18	9/17	9/17	9/17-18
	Time:	09:50	15:40	11:50-1150	08:00-08:00	1225	1555	1650-1650
	Lab Log #:	388235	388231	388232	388233	388244	388245	388234
GENERAL CHEMISTRY								
Turbidity								
Conductivity		E	E	E	E	E	E	E
Alkalinity				E	E			E
Hardness				E	E			
SOLIDS								
TS				E	E			E
TNVS				E	E			E
TSS		E	E	EW[2]	EW[2]	E	E	E
TNVSS				E	E			E
% Solids								
% Volatile Solids								
OXYGEN DEMAND PARAMETERS								
BOD5				EW[2]	EW[2]			E
CBOD5				EW[2]				
TOC (water)		E	E	E	E	E	E	E
TOC (soil/sed)								
NUTRIENTS								
Total Kjeldahl Nitrogen (TKN)								
NH3-N		E	E	E	E	E	E	E
NO2+NO3-N		E	E	E	E	E	E	E
Total-P		E	E	E	E	E	E	E
MISCELLANEOUS								
F-Coliform MF								
F-Coliform (soil/sed)								
T-Coliform (soil/sed)								
Cyanide (total)								
Cyanide (wk & dis)								
ORGANICS								
VOC (water)- Top 10 TICS								
BNAs (water)								
Pest/PCB (water) - Chlorinated								
METALS								
PP Metals (water)								
PP Metals (soil)								
HCO_3								
Boron								
Ca								
Mg								
Na								
FIELD OBSERVATIONS								
Temperature		E	E			E	E	
Temp-cooled				E	E			E
pH		E	E	E	E	E	E	E
Conductivity		E	E	E	E	E	E	E
Chlorine								

E	Ecology sample and analysis	Inf	Influent sample
W^2	Walla Walla sample and analysis	comp	composite sample
Pri	Primary clarifier effluent	grab	grab sample

Appendix B - Sampling Schedule - City of Walla Walla, 1996.

Parameter	Location:	Eff-1	Eff-2	Eff-E	Eff-W[2]*	Eff-3	Eff-4	Eff-5	Sludge	RcvWtr	TrnsBlk
	Type:	grab	grab	comp	comp	grab	grab	grab	grab	grab	grab
	Date:	9/17	9/17	9/17-18	9/17-18	9/17	9/17	9/17	9/17	9/17	9/16
	Time:	11:05	14:50	08:55-08:55	08:00-08:00	11:05	14:50	1630	11:50	14:15	18:20
	Lab Log	388235	388236	388237	388238	388239	388240	388246	388241	388242	388243
GENERAL CHEMISTRY											
Turbidity				E	E						
Conductivity		E	E	E	E						
Alkalinity				E	E						
Hardness				E	E					E	
SOLIDS											
TS				E	E						
TNVS				E	E						
TSS		E	E	EW[2]	EW[2]					E	
TNVSS				E	E						
% Solids									E		
% Volatile Solids									E		
OXYGEN DEMAND PARAMETERS											
BOD5				E	E						
CBOD5				E							
TOC (water)		E	E	E	E	E	E	E			
TOC (soil/sed)									E		
NUTRIENTS											
Total Kjeldahl Nitrogen (TKN)				E	E						
NH3-N		E	E	E	E					E	
NO2+NO3-N		E	E	E	E						
Total-P		E	E	E	E						
MISCELLANEOUS											
F-Coliform MF						E	EW[2]*	E			
F-Coliform (soil/sed)									E		
T-Coliform (soil/sed)									E		
Cyanide (total)		E									
Cyanide (wk & dis)		E									
ORGANICS											
VOC (water): Top 10 TICS		E	E								
BNAs (water)				E							
Pest/PCB (water) - Chlorinated				E							
METALS											
PP Metals (water)				E							E
PP Metals (soil)									E		
HCO_3				E							
Boron				E							
Ca				E							
Mg				E							
Na				E							
FIELD OBSERVATIONS											
Temperature		E	E			E	E	E		E	
Temp-cooled				E	E						
pH		E	E	E	E	E	E	E		E	
Conductivity		E	E	E	E	E	E	E		E	
Chlorine		E	E			E					

E	Ecology sample and a	comp	Sludge	Digested sludge sample	Inf	Influent sample	comp composite sample
W[2]	Walla Walla sample	grab	RcvWtr	Receiving water sample	Eff	effluent sample	grab grab sample
Pri	Primary clarifier effluent		TrnsBlk	Transfer Blank			* Separate, but concurrent samples

Appendix C - Analytic Methods - Walla Walla Class II, 1996

Parameter	Manchester Lab Methods	APHA Methods	Lab Used
GENERAL CHEMISTRY			
Turbidity	EPA, Revised 1983: 180.1	APHA, 1989: 2130B.	Manchester Environmental Lab
Conductivity	EPA, Revised 1983: 120.1	APHA, 1989: 2510A.	Manchester Environmental Lab
Alkalinity	EPA, Revised 1983: 310.1	APHA, 1989: 2320B	Manchester Environmental Lab
Hardness	EPA, Revised 1983: 130.2	APHA, 1989: 2340C.	Manchester Environmental Lab
SOLIDS			
TS	EPA, Revised 1983: 160.3	APHA, 1989: 2540B	Manchester Environmental Lab
TNVS	EPA, Revised 1983: 160.3	APHA, 1989: 2540E.	Manchester Environmental Lab
TSS	EPA, Revised 1983: 160.2	APHA, 1989: 2540D.	Manchester Environmental Lab
TNVSS	EPA, Revised 1983: 160.2	APHA, 1989: 2540D&E.	Manchester Environmental Lab
% Solids	APHA, 1992: 2540G.	APHA, 1992: 2540G.	Manchester Environmental Lab
% Volatile Solids	EPA, Revised 1983: 160.4	APHA, 1989: 2540E.	Manchester Environmental Lab
OXYGEN DEMAND PARAMETERS			
BOD5	EPA, Revised 1983: 405.1	APHA, 1989: 5210B	Manchester Environmental Lab
CBOD5	EPA, Revised 1983: 405.1		Manchester Environmental Lab
TOC (water)	EPA, Revised 1983: 415.1	APHA, 1989: 5310B	Manchester Environmental Lab
TOC (soil/sed)	EPA, Revised 1983: 415.1	APHA, 1989: 5310B.	Manchester Environmental Lab
NUTRIENTS			
Total Kjeldahl Nitrogen (TKN)			
NH3-N	EPA, Revised 1983: 350.1	APHA, 1989: 4500-NH3D.	Manchester Environmental Lab
NO2+NO3-N	EPA, Revised 1983: 353.2	APHA, 1989: 4500-NO3F.	Manchester Environmental Lab
Total-P	EPA, Revised 1983: 365.3	APHA, 1989: 4500-PF.	Manchester Environmental Lab
MISCELLANEOUS			
F-Coliform MF	APHA, 1992: 9222D	APHA, 1992: 9222D.	Manchester Environmental Lab
F-Coliform (soil/sed)	APHA, 1992: 9221A.	APHA, 1992: 9221A.	Manchester Environmental Lab
T-Coliform (soil/sed)	APHA, 1992: 9221A	APHA, 1992: 9221A.	Manchester Environmental Lab
Cyanide (total)	EPA, Revised 1983: 335.2	APHA, 1989: 4500-CNC.	Manchester Environmental Lab
Cyanide (wk & dis)	APHA, 1992: 4500-CNI	APHA, 1992: 4500-CNI	Manchester Environmental Lab
ORGANICS			
VOC (water)	EPA, 1986: 8260	APHA, 1989: 6210D	Manchester Environmental Lab
BNAs (water)	EPA, 1986: 8270	APHA, 1989: 6410B.	Manchester Environmental Lab
Pest/PCB (water) - Chlorinated	EPA, 1986: 8080	APHA, 1989: 6630C	Manchester Environmental Lab
METALS			
PP Metals (water)	EPA, Revised 1983: 200-299	APHA, 1989: 3000-3500*	Manchester Environmental Lab
PP Metals (soil)			

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EPA, Revised 1983. Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020 (Rev. March, 1983).

EPA, 1986: SW846. Test Methods for Evaluating Solid Waste Physical/Chemical Methods, SW-846, 3rd. ed.,November, 1986.

Appendix D - Quality Assurance/Quality Control - Walla Walla Class II Inspection - June, 1996

Priority Pollutant Cleaning Procedures for Wastewater Collection Equipment.

1. Wash with laboratory detergent
2. Rinse several times with tap water
3. Rinse with 10% HNO_3 solution
4. Rinse three (3) times with distilled/deionized water
5. Rinse with high purity acetone
6. Rinse with high purity Hexane
7. Rinse with high purity acetone
8. Allow to dry and seal with aluminum foil

Appendix E - VOA, BNA, Pesticide/PCB and Metals Scan Results - Walla Walla Class II Inspection, 1996

Parameter	Location:	Eff-1	Eff-2
	Type:	grab	grab
	Date:	9/17	9/17
	Time:	11:05	14:50
	Lab Log #:	38823	388236
VOA Compounds		µg/L	µg/L
Chloromethane		1 U	1 U
Dichlorodifluoromethane		10 UJ	REJ
Bromomethane		1 U	1 U
Vinyl Chloride		1 U	1 U
Chloroethane		1 U	1 U
Trichlorofluoromethane		1 UJ	1 UJ
Methylene Chloride		1 U	1 U
Acetone		4 U	3 J
Carbon Disulfide		2 U	2 U
1,1-Dichloroethene		1 U	1 U
1,1-Dichloroethane		1 U	1 U
trans-1,2-Dichloroethene		1 U	1 U
cis-1,2-Dichloroethene		1 U	1 U
2,2-Dichloropropane		1 U	1 U
Bromochloromethane		1 U	1 U
Chloroform		1.8	2.1
1,2-Dichloroethane		1 U	1 U
1,1,1-Trichloroethane		1 U	1 U
Carbon Tetrachloride		1 U	1 U
1,1-Dichloropropene		1 U	1 U
Bromodichloromethane		0.65 J	0.58 J
1,2-Dichloropropane		1 U	1 U
Dibromomethane		1 U	1 U
trans-1,3-Dichloropropene		0.94 U	0.94 U
Trichloroethene		1 U	1 U
Dibromochloromethane		1 U	1 U
1,2-Dibromoethane (EDB)		1 U	1 U
1,1,2-Trichloroethane		1 U	1 U
1,3-Dichloropropane		1 U	1 U
Benzene		1 U	1 U
cis-1,3-Dichloropropene		1.1 U	1.1 U
Bromoform		1 U	1 U
2-Hexanone		1 U	1 U
Tetrachloroethene		1 U	1 U
1,1,2,2-Tetrachloroethane		1 U	1 U
1,1,1,2-Tetrachloroethane		1 U	1 U
Toluene		1 U	1 U
Chlorobenzene		1 U	1 U
Ethylbenzene		1 U	1 U
Bromobenzene		1 U	1 U
1,2,3-Trichloropropane		1 U	1 U
2-Chlorotoluene		1 U	1 U
4-Chlorotoluene		1 U	1 U

E	Ecology sample	J	The analyte was positively identified. The associated numerical result is an estimate.
Eff	Effluent sample	REJ	The datum is unsuitable for all purposes.
grab	grab sample	U	The analyte was not detected at or above the reported result.
		UJ	The anaylte was not detected at or above the reported estimated result.

Appendix E (cont.) - VOA, BNA, Pesticide/PCB and Metals Scan Results - Walla Walla Class II Inspection, 1996

Parameter	Location:	Eff-1	Eff-2	Eff-E
	Type:	grab	grab	comp
	Date:	9/17	9/17	9/17-18
	Time:	11:05	14:50	08:55-08:55
	Lab Log #:	38823	388236	388237
VOA Compounds		µg/L	µg/L	µg/L
1,2,4-Trimethylbenzene		1 U	1 U	
tert-Butylbenzene		1 U	1 U	
1,3,5-Trimethylbenzene		1 U	1 U	
sec-Butylbenzene		1 U	1 U	
p-Isopropyltoluene		1 U	1 U	
1,2,3-Trichlorobenzene		10 U	10 UJ	
1,4-Dichlorobenzene		1 U	1 U	0.25 U
1,2-Dichlorobenzene		1 U	1 U	0.25 U
1,2,4-Trichlorobenzene		5 U	5 UJ	0.25 U
Naphthalene		10 UJ	10 UJ	0.25 U
Hexachlorobutadiene		1 U	1 U	0.25 U
o-Xylene		1 U	1 U	
1,3-Dichlorobenzene		1 U	1 U	0.25 U
1,1-Dichloropropanone		1 U	1 U	
1-Chlorobutane		1 U	1 U	
2-Methyoxy-2-Methylpropane		1 U	1 U	
Acrylonitrile		1 U	1 U	
Allyl Chloride		1 U	1 U	
Chloroacetonitrile		1 UJ	1 UJ	
Ethyl Ether		1 U	1 U	
Ethylmethacrylate		1 U	1 U	
Hexachloroethane		1 U	1 U	0.25 U
Methyacrilonitrile		1 U	1 U	
Methyl acrylate		1 U	1 U	
Methyl Methacrylate		1 U	1 U	
n-Butylbenzene		1 U	1 U	
n-Propylbenzene		1 U	1 U	
Nitrobenzene				0.25 U
Pentachloroethane		1 U	1 U	
Tetrahydrofuran		1 U	1 U	
Trans-1,4-Dichloro-2-butene		1 U	1 U	

Parameter	Location:	Eff-E
	Type:	comp
	Date:	9/17-18
	Time:	08:55-08:55
	Lab Log #:	388237
BNA Compounds		µg/L
Benzo(a)Pyrene		0.25 UJ
2,4-Dinitrophenol		5 U
Dibenzo(a,h)Anthracene		0.25 UJ
Benzo(a)Anthracene		0.5 U
4-Chloro-3-Methylphenol		0.25 U
Aniline		0.25 U

E	Ecology sample	U	The analyte was not detected at or above the reported result.
Eff	Effluent sample	UJ	The anaylte was not detected at or above the reported estimated result.
grab	grab sample		
comp	Composite sample		

Appendix E (cont.) - VOA, BNA, Pesticide/PCB and Metals Scan Results - Walla Walla Class II Inspection, 1996

Parameter	Location:	Eff-1	Eff-2	Eff-E
	Type:	grab	grab	comp
	Date:	9/17	9/17	9/17-18
	Time:	11:05	14:50	08:55-08:55
	Lab Log #:	38823	388236	388237
BNA Compounds		µg/L	µg/L	µg/L
Benzoic Acid				1.2 UJ
Hexachloroethane		1 U	1 U	0.25 U
Hexachlorocyclopentadiene				1.2 U
Isophorone				0.25 U
Acenaphthene				0.25 U
Phenanthrene				0.25 U
N-Nitrosodiphenylamine				0.25 U
Fluorene				0.25 U
Carbazole				0.25 U
Hexachlorobutadiene		1 U	1 U	0.25 U
Pentachlorophenol				2.5 U
2,4,6-Trichlorophenol				0.25 U
2-Nitroaniline				1.2 U
2-Nitrophenol				1.2 U
Naphthalene		10 UJ	10 UJ	0.25 U
2-Methylnaphthalene				0.25 U
2-Chloronaphthalene				0.25 U
3,3'-Dichlorobenzidine				0.25 U
Benzidine				2.5 U
2-Methylphenol				0.25 U
1,2-Dichlorobenzene		1 U	1 U	0.25 U
2,4,5-Trichlorophenol				1.2 U
Nitrobenzene				0.25 U
3-Nitroaniline				2.5 U
4-Nitroaniline				0.5 U
4-Nitrophenol				2.5 U
Benzyl Alcohol				1.2 U
2,4-Dimethylphenol				0.25 U
4-Methylphenol				0.25 U
1,4-Dichlorobenzene		1 U	1 U	0.25 U
4-Chloroaniline				0.25 U
Phenol				0.35
Pyridine				0.5 U
Bis(2-Chloroethyl)Ether				0.25 U
Bis(2-Chloroethoxy)Methane				0.25 U
Di-n-Octyl Phthalate				0.25 UJ
Hexachlorobenzene				0.25 U
Anthracene				0.25 U
1,2,4-Trichlorobenzene		5 U	5 UJ	0.25 U
2,4-Dichlorophenol				0.25 U
2,4-Dinitrotoluene				1.2 U
1,2-Diphenylhydrazine				0.25 U
Pyrene				0.25 U
Dibenzofuran				0.25 U
Indeno(1,2,3-cd)Pyrene				0.25 UJ
Benzo(b)Fluoranthene				0.25 UJ

E	Ecology sample	U	The analyte was not detected at or above the reported result.
Eff	Effluent sample	UJ	The anaylte was not detected at or above the reported estimated result.
grab	grab sample		
comp	Composite sample		

Appendix E (cont.) - VOA, BNA, Pesticide/PCB and Metals Scan Results - Walla Walla Class II Inspection, 1996

Parameter	Location:	Eff-1	Eff-2	Eff-E
	Type:	grab	grab	comp
	Date:	9/17	9/17	9/17-18
	Time:	11:05	14:50	08:55-08:55
	Lab Log #:	38823	388236	388237
BNA Compounds		µg/L	µg/L	µg/L
Fluoranthene				0.25 U
Benzo(k)Fluoranthene				0.25 UJ
Acenaphthylene				0.25 U
Chrysene				0.25 U
4,6-Dinitro-2-Methylphenol				2.5 U
1,3-Dichlorobenzene		1 U	1 U	0.25 U
2,6-Dinitrotoluene				1.2 U
N-Nitroso-di-n-Propylamine				0.25 U
1-Methylnaphthalene				0.25 U
2-Chlorophenol				0.25 U
Bis(2-Chloroisopropyl)Ether				0.25 U
Retene				0.25 U
Tetrachloroethene		1 U	1 U	
3B-Coprostanol				5 UJ
Caffeine				0.25 U
N-Nitrosodimethylamine				1.2 U
Ethanol, 2-(2-Butoxyethoxy)-				87 NJ
Ethanol, 2-Butoxy-, Phosphate (				26 NJ

Parameter	Location:	Eff-E
	Type:	comp
	Date:	9/17-18
	Time:	08:55-08:55
	Lab Log #:	388237
Pesticide/PCB Compounds		µg/L
alpha-BHC		0.0063 U
beta-BHC		0.0063 U
delta-BHC		0.0063 U
gamma-BHC (Lindane)		0.15
Aldrin		0.0063 U
Heptachlor		0.0063 U
Heptachlor Epoxide		0.0063 U
Endosulfan I		0.0063 U
Dieldrin		0.0063 U
4,4'-DDE		0.0063 U
Endrin		0.0063 U
Endosulfan II		0.0063 U
4,4'-DDD		0.0063 U
Endosulfan Sulfate		0.0063 U
4,4'-DDT		0.0063 U
Methoxychlor		0.0063 U
Endrin Ketone		0.0063 U
Toxaphene		0.19 U
Endrin Aldehyde		0.013 U

E	Ecology sample	NJ	There is evidence that the analyte is present. The associated numerical result is an estimate.
Eff	Effluent sample	U	The analyte was not detected at or above the reported result.
grab	grab sample	UJ	The anaylte was not detected at or above the reported estimated result.
comp	Composite sample		

Appendix E - VOA, BNA, Pesticide/PCB and Metals Scan Results - Walla Walla Class II Inspection, 1996

Parameter	Location:	Eff-E	TrnsBlk	Sludge
	Type:	comp	grab	grab
	Date:	9/17-18	9/16	9/17
	Time:	08:55-08	18:20	11:50
	Lab Log #:	388237	388243	388241
Metal Compounds		µg/L	µg/L	mg/Kg-dry wt.
Antimony		30 U	30 U	4 UJ
Arsenic		1.5 U	1.5 U	24.7 J
Beryllium		1 U	1 U	0.22
Cadmium		0.12	0.12	4.04
Chromium		5 U	5 U	305
Copper		6.7	1 U	406
Lead		1.9 J	1 U	157
Mercury		0.05 U	0.05 U	5.09
Nickel		10 U	10 U	17.1
Selenium		1.5 U	1.5 U	64.0
Silver		0.5 UJ	0.5 UJ	30.2 J
Thallium		1.5 U	1.5 U	3.7 UJ
Zinc		34	8.1	1140

E	Ecology sample	J	The analyte was positively identified. The associated numerical result is an estimate.
Eff	Effluent sample	U	The analyte was not detected at or above the reported result.
grab	grab sample	UJ	The anaylte was not detected at or above the reported estimated result.
comp	Composite sample	TrnsBlk	Transfer blank of effluent compositor
		Sludge	Sludge sample

Appendix F - Tentatively Identified Compounds - Walla Walla Class II - September, 1996

Eff-E
comp
09/17-18/96
0855-0855
388237

Bases, Acids, & Neutrals (BNA)

Parameter	Value	Qualifier	Units
1. Unknown 01	27	NJ	ug/L
2. Unknown 02	5.3	NJ	ug/L
3. Ethanol, 2-(2-Butoxyethoxy)-	9.1	NJ	ug/L
4. Ethanol, 2-(2-Butoxyethoxy)-, Acetate	87	NJ	ug/L
5. Bi-2-Cyclohexen-1-Yl	100	NJ	ug/L
6. Cyclohexanol, 2-Bromo-, Trans-	8	NJ	ug/L
7. Cyclohexanol, 4-Chloro-, Trans-	4.6	NJ	ug/L
8. Unknown Compound 3	2.4	NJ	ug/L
9. 2-Pentene, 3,4-dimethyl-, (	4.2	NJ	ug/L
10. Cyclotetrasiloxane, Octamethyl-	6.2	NJ	ug/L
11. Cyclohexanol, 2-Chloro-Trans-	337	NJ	ug/L
12. Cyclopropane, 1-chloro-2-(1	3.7	NJ	ug/L
13. Ethanol, 2-Butoxy-, Phosphate (3:1)	26	NJ	ug/L
14. 2-Hexen-1-Ol, (Z)-	3.3	NJ	ug/L

NJ There is evidence that the analyte is present. The associated numerical result is an estimate.

Appendix G - GLOSSARY - Walla Walla Class II Inspection - September, 1994

BOD_5	Five Day Biochemical Oxygen Demand
$CaCO_3$	Calcium Carbonate
CLP	Contract Laboratory Program
EPA	Environmental Protection Agency
Kg	kilogram (1×10^3 grams)
L	Liter (1×10^3 milliliters)
lbs/day	Pounds per Day
m^3	Cubic meter (1×10^3 liters)
MF	Membrane Filter
mg	milligram (1×10^{-3} grams)
MGD	Million Gallons per Day
mL	Milliliter (1×10^{-3} liters)
MPN	Most Probable Number
NH_3	Ammonia
NPDES	National Pollutant Discharge Elimination System
PCB	Polychlorinated Biphenyls
pH	Negative Log_{10} of Hydrogen Ion Concentration
PO_4	Phosphate
PP	Priority Pollutant
QA/QC	Quality Assurance/Quality Control
RPD	Relative Percent Difference
TIC	Total Inorganic Carbon or Tentatively Identified Compound
TKN	Total Kjeldahl Nitrogen
TNVS	Total Non-Volatile Solids
TNVSS	Total Non-Volatile Suspended Solids
TOC	Total Organic Carbon
TP	Total Phosphorous
TS	Total Solids
TSS	Total Suspended Solids
TVS	Total Volatile Solids
µg	Microgram (1×10^{-6} grams)
µg/L	Micrograms per Liter
VOA	Volatile Organic Analysis
VSS	Volatile Suspended Solids
WWTP	Wastewater Treatment Plant